

WHAT IS CLAIMED IS:

1. A multi-step landing micro-mirror, comprising:

a trench formed in a substrate and having N-1 steps in one side wall thereof;

N plates rotated in or on said trench; and

2N springs for connecting said plates to each other;

wherein said N plates are composed of an outermost first plate, a second plate connected with said first plate by the spring and located in said first plate, ..., and a N-th plate connected with a (N-1)-th plate by the spring and located in said (N-1)-th plate;

wherein when voltages are applied to said N plates and said trench, respectively, said first plate is subjected to a first landing with a predetermined displacement angle on a first step of said trench due to the electrostatic force, said second plate is subjected to a second landing with the predetermined displacement angle on a second step of said trench, ..., said N-th plate is subjected to a N-th landing with the predetermined displacement angle on the other side wall of said trench.

2. The multi-step landing micro-mirror according to claim 1, wherein the first plate, the second plate, ..., and the (N-1)-th plate among said N plates have a rectangular ring shape.

3. The multi-step landing micro-mirror according to claim 1, wherein said N-th plate is the mirror having a rectangular shape.

4. The multi-step landing micro-mirror according to claim 1, wherein said $2N$ springs have a meander type, a torsion beam type, or a complex type of them.

5. The multi-step landing micro-mirror according to claim 1, wherein the sum total of the rotation angle of said first landing, the rotation angle of said second landing, \dots , and the rotation angle of said N -th landing is 90 degree.

6. A method for manufacturing the multi-step landing micro-mirror according to claim 1, comprising the steps of:

- (a) forming a trench having $N-1$ steps formed in one side wall thereof in a substrate;
- (b) forming a first insulating film in and on said substrate;
- (c) depositing and patterning a conductive film in and on said substrate to form an electrode layer in and around said trench;
- (d) forming a second insulating film in and on the substrate;
- (e) attaching a silicon layer on and around said trench; and
- (f) etching said silicon layer to form N plates and $2N$ springs.

7. The method for manufacturing the multi-step landing micro-mirror according to claim 6, wherein said substrate is a glass or a silicon substrate.

8. The method for manufacturing the multi-step landing micro-mirror

according to claim 6, further comprising the step of polishing said silicon layer to have a thickness in the range of 50 to 620 μ m, after the step (e).

9. A multi-step landing micro-mirror array, wherein the multi-step landing micro-mirrors according to claim 1 are arranged on a same plane in a $m \times n$ matrix shape to obtain a plurality of the reflective light beams with respect to an incident light.